DEVI 3.1 - SELECTION OF TRAINING GROUPS OF SECONDARY VOCATIONAL SCHOOL TEACHERS

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CONTENTS

1. INTRODUCTION ............................................................................................................. 3

2. INVITATION TO REGISTRATION FOR PARTICIPATION IN NeReLa WINTER SCHOOL ................................................................. 3

   2.1 Number of teachers registered per university center (with number of schools and towns) ........................................................................ 4

       P1 UNIKG UNIVERSITY OF KRAGUJEVAC: 17 schools, 15 towns, 52 teachers ........................................................................... 5

       P2 UB UNIVERSITY OF BELGRADE: 15 schools, 7 towns, 38 teachers .......... 6

       P3 UNINI UNIVERSITY OF NIŠ: 13 schools, 11 towns, 36 teachers .............. 7

       P4 UNS UNIVERSITY OF NOVI SAD: 8 schools, 8 towns, 21 teachers .......... 8

3. ADDITIONAL QUESTIONNAIRE FOR REGISTERED TEACHERS ........................................ 10

   Items in the Questionnaire: ............................................................................................. 10

   The analysis of a database of teachers registered for participation in the NeReLa Winter school ......................................................................................... 10

   Question 7 and 8: Teaching fields and University center ............................................. 11

   Question 9: Total work experience and teaching experience ...................................... 11

   Question 11 and 12: Basic ICT knowledge and ICT infrastructure .............................. 12

   Question 13: The distribution of teachers per teaching subjects ................................. 12

       Electrotechnics (58 teachers): .................................................................................... 12

       Computer engineering (47 teachers): ........................................................................ 12

       Mechatronics (42 teachers): ...................................................................................... 12

Appendix 1 ....................................................................................................................... 14
1. INTRODUCTION

This report presents overview of activities conducted within starting activity DEV3.1 – Selection of training groups of secondary vocational school teachers in work package DEV3. The aim of activity DEV3.1 is selection of training groups of secondary vocational school teachers from all over Serbia for the purpose of their participation in trainings for the usage of remote experiments.

The selection of secondary vocational technical schools teachers was started by sending an Announcement letter for their application for the participation in NeReLa Winter School (NeReLa Winter School was planned as first part of planned trainings for the usage of remote experiments). On the basis of teachers’ received applications, the database of teachers registered for participation in the NeReLa Winter School was created.

The analysis of formed database conducted during December 2014 for the purpose of better planning of activities during winter school in each of four university centers.

2. INVITATION TO REGISTRATION FOR PARTICIPATION IN NeReLa WINTER SCHOOL

Association of Electrotechnical Vocational Secondary Schools (P10 AEVSS) and Association of Mechanical Vocational Secondary Schools (P11 AMVSS) sent an Announcement letter for application of vocational technical schools teachers for the participation in Training for teachers of Secondary Vocational Schools for the usage of remote experiments within NeReLa project in the middle of October 2014. The announcement letter is in the Appendix 1.

The content of the application form for the teachers of Secondary Vocational Schools is as follows:

- Short CV,
- List of the attended trainings, seminars, workshops, which are related to the curriculum of the subject as well as to the trainings for computer usage: full title, institution—coordinator, sometimes authors, time of attending, number of hours, venue.
- Description of the specific professional activities: setting up a laboratory and new laboratory exercises, participation in designing curriculum, course books, student manuals and guides, teaching material and aids, etc.
- Participation in competitions, technical meetings and fairs, the achieved results.
- Contact information: personal contact (mobile phone), e-mail, and school address.
2.1 Number of teachers registered per university center (with number of schools and towns)

<table>
<thead>
<tr>
<th>University</th>
<th>Schools</th>
<th>Towns</th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>P4 UNS UNIVERSITY OF NOVI SAD</td>
<td>8</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>P3 UNINI UNIVERSITY OF NIŠ</td>
<td>13</td>
<td>11</td>
<td>36</td>
</tr>
<tr>
<td>P2 UB UNIVERSITY OF BELGRADE</td>
<td>15</td>
<td>7</td>
<td>38</td>
</tr>
<tr>
<td>P1 UNIKG UNIVERSITY OF Kragujevac</td>
<td>17</td>
<td>15</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td><strong>53</strong></td>
<td><strong>41</strong></td>
<td><strong>147</strong></td>
</tr>
</tbody>
</table>
P1 UNIKG UNIVERSITY OF KRAGUJEVAC: 17 schools, 15 towns, 52 teachers

I. Čačak 24 teachers
   1. Tehnička škola (Technical school) 4 teachers
   2. Mašinsko-saobraćajna škola (Mechanical-traffic school): 3 teachers

II. Kragujevac 7 teachers
   3. Prva tehnička škola (First Technical School) 4 teachers
   4. Politehnička škola (Politechnical School) 3 teachers

III. Leposavić 5 teachers
   5. Srednja škola “Nikola Tesla” (Secondary school “Nikola Tesla”) 5 teachers

IV. Gornji Milanovac 3 teachers
   6. Tehnička škola “J. Žujović” (Technical School) 3 teachers

V. Velika Plana 3 teachers
   7. Tehnička škola “Nikola Tesla” (Technical Sc. “Nikola Tesla”) 3 teachers

VI. Valjevo 3 teachers
   8. Tehnička škola (Technical School) 3 teachers

VII. Prijedor 3 teachers
   9. Mašinsko elektrotehnička škola (Mechanical-Electrotechnical Sc.): 3 teachers

VIII. Paraćin 3 teachers
   10. Mašinsko elektrotehnička škola (Mechanical-Electrotechnical Sc.) 3 teachers

IX. Nova Varoš 3 teachers
   11. Tehnička škola (Technical School) 3 teachers

X. Užice 3 teachers
   12. Tehnička škola (Technical School): 3 teachers

XI. Trstenik 3 teachers
   13. Tehnička škola (Technical School): 3 teachers

XII. Sjenica 3 teachers
   14. Tehničko -poljoprivredna škola (Technical-agricultural Sc): 3 teachers

XIII. Arilje 3 teachers
   15. SŠ “Sveti Ahilije” (Secondary School “St. Ahilije) 3 teachers

XIV. Kraljevo 2 teachers
   16. MTŠ “14 oktobara” (MT School “14 October”) 2 teachers

XV. Topola 1 teacher
   17. Srednja škola “Kralj Petar” (Secondary School “King Petar”) 1 teacher
### P2 UB UNIVERSITY OF BELGRADE: 15 schools, 7 towns, 38 teachers

<table>
<thead>
<tr>
<th>Town</th>
<th>Number of Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Beograd</strong></td>
<td></td>
</tr>
<tr>
<td>1. Elektrotehnička škola Zemun (Electrotechnical School Zemun)</td>
<td>2 teachers</td>
</tr>
<tr>
<td>2. ETŠ “Nikola Tesla” (Electrotechnical School “Nikola Tesla”)</td>
<td>2 teachers</td>
</tr>
<tr>
<td>3. ETŠ “Rade Končar” (Electrotechnical School “Rade Koncar”):</td>
<td>3 teachers</td>
</tr>
<tr>
<td>5. Saobraćajno-tehnička škola Zemun (Trafic-technical School Zemun)</td>
<td>1 teacher</td>
</tr>
<tr>
<td>6. Srednja tehnička PTT škola (Secondary technical PTT school)</td>
<td>3 teachers</td>
</tr>
<tr>
<td>7. SŠ za informacione tehnologije IZHS (Secondary School for IT):</td>
<td>3 teachers</td>
</tr>
<tr>
<td>8. Tehnička škola GSP (Technical School GSP)</td>
<td>3 teachers</td>
</tr>
<tr>
<td>9. Vazduhoplovna akademija</td>
<td>3 teachers</td>
</tr>
<tr>
<td><strong>II. Obrenovac</strong></td>
<td>3 teachers</td>
</tr>
<tr>
<td>10. Tehnička škola (Technical School):</td>
<td>3 teachers</td>
</tr>
<tr>
<td><strong>III. Pančevo</strong></td>
<td>3 teachers</td>
</tr>
<tr>
<td>11. ETŠ “Nikola Tesla” (Electrotechnical School “Nikola Tesla”)</td>
<td>3 teachers</td>
</tr>
<tr>
<td><strong>IV. Loznica</strong></td>
<td>2 teachers</td>
</tr>
<tr>
<td>12. Tehnička škola (Technical School):</td>
<td>2 teachers</td>
</tr>
<tr>
<td><strong>V. Mladenovac</strong></td>
<td>2 teachers</td>
</tr>
<tr>
<td>13. Tehnička škola (Technical School):</td>
<td>2 teachers</td>
</tr>
<tr>
<td><strong>VI. Arandelovac</strong></td>
<td>2 teachers</td>
</tr>
<tr>
<td>14. TŠ “Miletta Nikolić” (Technical School “Mileta Nikolic”):</td>
<td>2 teachers</td>
</tr>
<tr>
<td><strong>VII. Smederevo</strong></td>
<td>2 teachers</td>
</tr>
<tr>
<td>15. Tehnička škola (Technical School):</td>
<td>2 teachers</td>
</tr>
</tbody>
</table>
P3 UNINI UNIVERSITY OF NIš: 13 schools, 11 towns, 36 teachers

I. Niš 11 teachers
   1. ETŠ “Nikola Tesla” (Electrotechnical School “Nikola Tesla”): 5 teachers
   2. ETŠ “Mija Stanimirović” (Electrotechnical School “MS”): 4 teachers
   3. Mašinska škola (Mechanical School): 2 teachers

II. Aleksinac 4 teachers
   4. Tehnička škola “Prota S. Dimitrijević” (Technical School “Prota S. Dimitrijevic”): 4 teachers

III. Zaječar 3 teachers
   5. Tehnička škola (Technical School): 3 teachers

IV. Bor 3 teachers
   6. Mašinsko-elektrotehnička škola (Mechanical School): 3 teachers

V. Knjaževac 3 teachers
   7. Tehnička škola (Technical School): 3 teachers

VI. Leskovac 3 teachers
   8. Tehnička škola “Rade Metalac” (Technical School): 3 teachers

VII. Pirot 3 teachers
   9. Tehnička škola (Technical School): 3 teachers

VIII. Vladičin Han 2 teachers
   10. Tehnička škola (Technical School): 2 teachers

IX. Vranje 2 teachers
   11. Tehnička škola (Technical School): 2 teachers

X. Vlasotince 1 teacher
   12. Tehnička škola (Technical School): 1 teacher

XI. Kladovo 1 teacher
   13. Tehnička škola (Technical School): 1 teacher
P4 UNS UNIVERSITY OF NOVI SAD: 8 schools, 8 towns, 21 teachers

I. Novi Sad  3 teachers
   1. Elektrotehnička škola “Mihailo Pupin” (Electrotechnical School “Mihajlo Pupin”): 3 teachers

II. Bečej  3 teachers
   2. Tehnička škola (Technical School): 3 teachers

III. Kanjiža  3 teachers
   3. PTCS “Besedeš Jozef” 3 teachers

IV. Kula  3 teachers
   4. STŠ “Mihailo Pupin” (Secondary Technical School “Mihajlo Pupin”): 3 teachers

V. Subotica  3 teachers
   5. Tehnička škola “Ivan Sarić” (Technical School “Ivan Saric”) 3 teachers

VI. Ada  2 teachers
   6. Tehnička škola (Technical School): 2 teachers

VII. Vršac  2 teachers
   7. Školski centar “Nikola Tesla” (School Centre “Nikola Tesla”): 2 teachers

VIII. Sombor  2 teachers
   8. Srednja tehnička škola: (Secondary Technical School): 2 teachers
Fig 1. Secondary Vocational Schools in 4 University centers in NeReLA project
3. ADDITIONAL QUESTIONNAIRE FOR REGISTERED TEACHERS

After registration, teachers received Questionnaire for acquiring additional information on their professional experience.

Items in the Questionnaire:
1. Surname
2. Name
3. E-mail adress
4. Mobile phone
5. School
6. School address
7. Teaching fields: Electrotechnics, Computer engineering, Mechatronics
8. University centar: Beograd, Novi Sad, Niš, Kragujevac
9. Years of work experience:
10. Years of work experience in the school:
11. Basic ICT knowledge: YES / NO
12. Existence of necessary ICT infrastructure in schools: YES / NO
13. Select one of your course (from the courses which you realized in the school) for which you want to realize remote experiment
14. Acceptance to their contact details be made available to other teachers-participants in training workshops: YES / NO

The analysis of a database of teachers registered for participation in the NeReLa Winter school

Number of registered teachers:
- In total: 153 teachers
- Completed the questionnaire: 147 teachers
- Data analyzed and shown for: 144 teachers
Question 7 and 8: Teaching fields and University center

<table>
<thead>
<tr>
<th></th>
<th>Electrotechnics</th>
<th>Mechatronics</th>
<th>Computer engineering</th>
<th>In total by center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgrade (UB)</td>
<td>17</td>
<td>9</td>
<td>12</td>
<td>38</td>
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<tr>
<td>Čačak (UNIKG)</td>
<td>22</td>
<td>15</td>
<td>15</td>
<td>52</td>
</tr>
<tr>
<td>Niš (UNINI)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>36</td>
</tr>
<tr>
<td>Novi Sad (UNS)</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>In total by</td>
<td>58</td>
<td>42</td>
<td>47</td>
<td>147</td>
</tr>
<tr>
<td>engineering field</td>
<td></td>
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Question 9: Total work experience and teaching experience

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<th>Experience in teaching</th>
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<td>Mt</td>
<td>16,44558</td>
<td>12,61565</td>
</tr>
<tr>
<td>Min</td>
<td>2,5</td>
<td>1</td>
</tr>
<tr>
<td>Max</td>
<td>34</td>
<td>30</td>
</tr>
</tbody>
</table>
Question 11 and 12: Basic ICT knowledge and ICT infrastructure

All surveyed teachers:
- Have basic ICT knowledge,
- Have the necessary ICT infrastructure in their schools
- Agreed that their contact details can be made available to other teachers-participants in training workshops (with the exception of 3 teachers).

Question 13: The distribution of teachers per teaching subjects

**Electrotechnics (58 teachers):**
- Control systems: 18 (BG 6, KG 6, NI 3, NS 3)
- Fundamentals of Electrical Engineering: 15 (BG 7, KG 3, NI 4, NS 1)
- Electrical machines, Electrical drives: 10 (BG 2, KG 7, NI 1, NS 0)
- Electrical measurements: 8 (BG 0, KG 3, NI 3, NS 2)
- Electrical Power Engineering: 4 (BG 1, KG 3, NI 0, NS 0)
- Unclassified: 3 (BG 1, KG 1, NI 1, NS 0)

**Computer engineering (47 teachers):**
- Electronics, Digital Electronics, Measurements in electronics: 18 (BG 3, KG 6, NI 5, NS 4)
- Computer Networks, Programming, Digital control systems, computer hardware: 15 (BG 3, KG 7, NI 4, NS 1)
- Telecommunications, Audio technique, Video technique, Techniques of digital and analog transmission: 11 (BG 5, KG 1, NI 2, NS 3)
- Unclassified: 3 (BG 1, KG 1, NI 1, NS 0)

**Mechatronics (42 teachers):**
- Mechatronics, Mechatronic systems, Testing and diagnosis of mechatronic systems: 12 (BG 1, KG 8, NI 3, NS 0)
- Mechanical elements, Modelling of mechanical elements, Constructing: 7 (BG 4, KG 1, NI 0, NS 2)
- Automation, Robotics: 6 (BG 1, KG 1, NI 2, NS 2)
- Hydraulic and pneumatic components: 5 (BG 1, KG 3, NI 1, NS 0)
- PLC, Numerical machines, Programming for digital control: 5 (BG 1, KG 2, NI 2, NS 0)
- Combustion engines, exploitation, Vehicles maintenance: 3 (BG 1, KG 0, NI 2, NS 0)
- Transducers: 2 (BG 0, KG 0, NI 0, NS 2)
- Unclassified: 2 (BG 0, KG 0, NI 2, NS 0)
Additional information:
In total: 128 teachers „covered“ with 10 groups (fields) of remote experiments
For 8 teachers their teaching subjects didn’t distribute within above 10 groups
For 3 teachers their data may not be publicly available
5 teachers didn’t complete the questionnaire
Announcement letter for application of vocational technical schools teachers for the participation in Training for teachers of Secondary Vocational Schools for the usage of remote experiments within NeRela project

Project Description

Tempus Project NeRela, titled “Building Network of Remote Labs for strengthening university-secondary vocational schools collaboration”, is aimed to improve engineering studies in Serbia by introducing innovative teaching methods of engineering education through remote experiment implementation and strengthening the collaboration between universities and vocational technical schools (through trainings of secondary vocational schools teachers for the usage of remote experiments in teaching). Thus, the attractiveness of engineering studies among vocational school students increases as well as their interest in enrolling in these study programmes in Serbia. The realization of the project lasting three years started on 1/12/2013. The project coordinator is University of Kragujevac, and the project is directed by Dr. Radinka Kruda, professor at Faculty of Technical Sciences in Cacak. Besides University of Kragujevac, project partners are the following universities from Serbia: University of Belgrade, University of Novi Sad and University of Nis. Non-university partners from Serbia are: Network of Regional centers for vocational schools teacher professional development „RC and CSU Network”, Association of Electrotechnical Schools of Serbia, Association of Mechanical Schools of Serbia and Balkan Distance Education Network (Baden).

Partners of the project are the following European universities: University of Maribor, Slovenia; University of Deusto, Bilbao, Spain; University of Porto, Portugal; European University Cyprus. Non-university EU partner of the project is a company Best Cybernetics, Patras, Greece.

The project will provide procurement of the most up-to-date equipment for the laboratories of the four largest universities in Serbia. The equipment will facilitate the realization of the remote experiments in the fields of electrical engineering, computing engineering and mechatronics. In cooperation with European partner institutions, which are highly experienced in the implementation of remote experiments at engineering studies and networking of remote laboratories, a web platform – Library of Remote Experiments – LiReX will be established within the project. The web platform will enable students to approach a network of remote laboratories via Internet and conduct experiments from these remote laboratories. The project includes a set of trainings for approximately 180 teachers of secondary vocational schools. The trainings will enable the teachers of secondary vocational schools to use the remote experiments within the realization of their teaching activities.
Trainings for teachers of Secondary Vocational Schools for the usage of remote experiments

- Prerequisites for successful realization of the trainings and the usage of acquired knowledge and skills:
  - Technical prerequisites: computers with internet connection, which enables continuous video streaming in a computer classroom or a laboratory of the vocational technical school where the training participant works;
  - Readiness of the teachers – participants of the trainings:
    - required computer skills: active knowledge and usage of MS Office, internet and different communication tools (e-mail, Skype, Facebook ...);
    - readiness of secondary vocational schools teachers to implement remote experiments in teaching of vocational subjects in vocational technical schools in the fields of electrical engineering, computer engineering and mechatronics.

- Method of trainings realization:
  - Winter school (January, 2014) covers one-day training at the faculties of four partner universities from Kragujevac, Belgrade, Nis and Novi Sad for 4 groups X 20 (max 80) teachers
  - Summer school (July, 2014) covers two-day on-line training at four selected regional centers for vocational schools teacher professional development for the same 4 groups X 20 (max 45) teachers

- Method of group selections for the trainings:
  - Regional distance: groups will be selected according to the least possible distance between the place where the participants are employed and University centers where Winter School will take place; therefore Regional centers in which Summer School will take place are bound to be near University centers in which the Winter School trainings will take place

- Realizators of the trainings:
  - Winter School is realized by:
    - Partner universities from Serbia
    - EU partner universities
    - Balkan Distance Education Network (BADEN)
• Summer School is realized by:
  - Partner universities from Serbia
  - Balkan Distance Education Network (BADEN)

■ Educational fields within which remote experiments are realized at partner universities:

  • Electrical engineering: electrical measuring, electronics, power engineering, electric drives and machines, automatic control systems...
  • Computer engineering: signals and systems, digital signal processing, digital control systems, ...
  • Mechanical engineering: mechatronics

■ Responsibilities of the participants:

1. The participants are required to:
   • attend the trainings regularly: one-day training programme – 8 classes (Winter School) in one of the four university centers (Cacak, Belgrade, Nis and Novi Sad) in second (or third) week of 2015, and
   • participate in the activities in two-day training – 16 classes (Summer School) in one of the 4 regional centers for vocational schools teacher professional development during summer holiday in 2015 (beginning of July)

2. The participants should be ready to actively participate in creation and completion of remote experiments library by giving their suggestions and recommendations.

3. The participants are required to fill out online evaluation questionnaire at the end of Winter and Summer School.

4. After completion of Summer School where the participants will conduct a specific remote experiment(s), the participants will have to write a short report on the Moodle platform regarding the conducted remote experiment(s) and give their suggestions and observations. Thus, the quality of the remote experiments will be improved.

5. The participants are recommended to mandatorily apply remote experiments into teaching of vocational subjects after completion of the training in 2016/2017.
Content of the application form for trainings for teachers of Secondary Vocational Schools for the usage of remote experiments:

1. Short CV

2. List of the attended trainings, seminars, workshops, which are related to the curriculum of the subject as well as to the trainings for computer usage: full title, institution – coordinator (sometimes authors), time of attending, number of hours, venue.

3. Description of the specific professional activities: setting up a laboratory and new laboratory exercises, participation in designing curriculum, course books, student manuals and guides, teaching material and aids, etc.

4. Participation in competitions, technical meetings and fairs, the achieved results.

5. Contact information: personal contact (mobile phone), e-mail, school address.

The training program within Winter School (January, 2015) and Summer School (July, 2015) is free of charge for the planned number of participants (max 180); travel expenses are covered by NeReLa project. From each school, maximum three teachers who fulfill the conditions can apply for the planned training which lasts 3 days in total (Winter and Summer school) in 2015. It is recommended that the teachers of subjects from 3 different engineering fields apply from one school. The engineering fields are the following:

- Electrical engineering: electrical measuring, electronics, telecommunications, power engineering, electric machines, electric drives, automated control systems...

- Computer engineering: signals and systems, digital signal processing, digital control systems...

- Mechanical engineering: Mechatronics